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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/893,803	06/28/2001	Bharath Rangarajan	F0660	7099

7590 09/10/2004

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EXAMINER
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ROSENBERGER, RICHARD A

ART UNIT	PAPER NUMBER
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2877

DATE MAILED: 09/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/893,803

Applicant(s)

RANGARAJAN ET AL.

Examiner

Richard A Rosenberg

Art Unit

2877

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 June 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al (US 6,643,557) in view of the acknowledged prior art and Moslehi (US 5,719,495).

Miller et al teaches using scatterometry to control an etch process; see figure 4 in particular, with box 420 ("acquire and analyze scatterometry data") and boxes 440 and 450 ("perform feedback corrections" and "perform feed-forward corrections", respectively).

Miller does not explicitly teach using scatterometry to measure "multi-slope features", although that reference does teach using is to obtain "line shape adjustments" (column 5, lines 19-21 and column 8, lines 13-15). The instant specification presents the necessary scatterometry techniques to practice the invention as being known in the prior art ( page 12, lines 12-16: "The scatterometry system 822 employed in the measuring system may be any scatterometry system suitable to carry out the present . . . [s]catterometry systems are well known in the art and therefore further discussion related thereto is limited for sake of brevity.").

As those in the art, as shown by Miller, knew that scatterometry can be used to control an etch process including "line shape adjustments", and knew that scatterometry could be used to measure multi-slope features, it would have been obvious to control such multi-slope features using scatterometry in a system such as taught by Miller et al.

Miller does not appear to state that the measurements are made *in situ*. It is known in the art that such measurement and process control can be made *in situ*. Moslehi, for example, teaches the *in situ* use (column 8, line 21) of an optical measurement device for process control (column 8, lines 47-54) in processing tools such as etch processes (column 8, lines 24, 27). The measurement tool of Moslehi uses scattered light (throughout the patent, see claim 1, column 22, line 15 of the patent as a single example). Thus those in the art known that optical measurement tools, including those which use scattered light, can be usefully used for *in situ* measurements for process control.

It is known in the art to use scatterometry to measure dimensions on a wafer for process control, and it is known that such optical measurements used for process control can be made *in situ*. It would have been obvious to use the scatterometry for such *in situ* measurements and control because it is known that scatterometry can be used to make measurements that are appropriate for process control, and it is known to make measurements appropriate for process control *in situ*. There is

nothing in the art that would suggest to those in the art that scatterometry would cease to work if the object being measured is in a process chamber.

3. The remarks filed 8 June 2004 have been considered. The remarks appear to overcome the rejection under 35 USC 112, first paragraph.


The remarks relating to the use of scatterometry in situ have been considered; see, however, the newly cited reference to Moslehi. The remarks point out that the instant specification sets forth that the in situ measurements can be made while the etch process is in progress (see the remarks, page 14, lines 7, instant specification, page 17, lines 17-18). This does not appear to be in the claims; none of the claims all appear to set forth making the measurements while the etch process is in progress, as opposed to, for example, stopping the etch process and making the measurement in place after etching. It is noted, however, that Moslehi, in column 8, lines 20-22, refers to "suggested critical in-situ sensors (real-time as well as pre- and post-process sensors", which at least suggests making the measurements while the process is being performed.

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Richard A Rosenberger whose telephone number is (571) 272-2428. The examiner can normally be reached on Monday through Friday during the hours of 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on (571) 272-2800 ext. 77. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

R. A. Rosenberger  
6 September 2004



Richard A. Rosenberger  
Primary Examiner